CLAIMS

1. Method of cooling an electrolytic cell (1) intended for aluminium production by means of igneous electrolysis, said cell (1) comprising a pot (20) comprising a metal shell (2) having lateral walls (21, 22) and at least one bottom wall (23), said pot (20) being intended to contain an electrolyte bath (13) and a liquid metal pad (12), said method being characterised in that it comprises:

- producing heat transfer fluid droplets,

- placing all or part of said droplets in contact with the shell (2), so as to induce the vaporisation of all or part of said droplets.

2. Cooling method according to claim 1, characterised in that said droplets are placed in contact with the shell (2) by confinement in the vicinity of the shell, by channelling, projection, or a combination of said means.

3. Cooling method according to claim 1 or 2, characterised in that said droplets are placed in contact with a specified surface (107) of the shell (2).

4. Cooling method according to any of claims 1 to 3, characterised in that the electrolytic cell (1) is also equipped with at least one confinement means (101) to form a confined space (102) in the vicinity of, or in contact with, a specified surface (107) of at least one of the walls (21, 22, 23) of the shell (2), and in that it comprises the production of heat transfer fluid droplets in said space (102), so as to place all or part of said droplets in contact with said surface (107).

5. Cooling method according to claim 4, characterised in that the confinement means (101) forms a confined space (102) in the vicinity of, or in contact with, a specified surface (107) of at least one of the lateral walls (21, 22) of the shell (2).

6. Cooling method according to claim 4 or 5, characterised in that the confinement means (101) is contiguous or fixed to the shell (2) or integral therewith.

7. Cooling method according to any of claims 1 to 6, characterised in that said droplets are produced by spraying said heat transfer fluid.

8. Cooling method according to claim 7, characterised in that at least one nozzle is used to carry out said spraying.

9. Cooling method according to any of claims 1 to 8, characterised in that said heat transfer fluid is water.

10. Cooling method according to claim 9, characterised in that the water is purified.

11. Cooling method according to any of claims 1 to 10, characterised in that said droplets are mixed with a carrier gas.

12. Cooling method according to claim 11, characterised in that said carrier gas is used to produce said droplets by spraying.

13. Cooling method according to claim 11 or 12, characterised in that said carrier gas is air.

14. Cooling method according to any of claims 1 to 13, characterised in that it comprises control of the heat transfer fluid droplet production rate.

15. Cooling method according to any of claims 1 to 14, characterised in that said droplets have a size between 0.1 and 5 mm, and preferentially between 1 and 5 mm.

16. Cooling method according to any of claims 1 to 15, characterised in that the droplets form a mist or aerosol.

17. Cooling method according to any of claims 1 to 16, characterised in that the droplets are typically produced at a specified distance D from one of the walls (21, 22, 23) of the shell (2) less than 20 cm, so as to limit the coalescence of said droplets before their vaporisation in contact with said wall.

18. Cooling method according to any of claims 1 to 17, characterised in that the confinement means (101) comprises at least one casing.

19. Cooling method according to claim 18, characterised in that said casing (101) is positioned so that it overlaps with the average level of the interface (19) between the electrolyte bath (13) and the liquid metal pad (12).

20. Cooling method according to any of claims 1 to 19, characterised in that it also comprises evacuating all or part of the heat transfer fluid vapour

formed by the vaporisation of all or part of said droplets upon contacting the shell (2).

21. Cooling method according to claim 20, characterised in that said vapour is evacuated by means of natural ventilation, by suction or blowing, or a combination of said means.

22. Cooling system (100) of an electrolytic cell (1) intended for aluminium production by means of igneous electrolysis, said cell (1) comprising a pot (20) comprising a metal shell (2) having lateral walls (21, 22) and a bottom wall (23), said pot (20) being intended to contain an electrolyte bath (13) and a liquid metal pad (12), said system being characterised in that it comprises at least one means (103) to produce heat transfer fluid droplets and a means (101) to place all or part of said droplets in contact with the shell (2), so as to induce the vaporisation of all or part of said droplets.

23. Cooling system (100) according to claim 22, characterised in that it also comprises:

- at least one confinement casing (101) at a specified distance from at least one of the walls (21, 22, 23) of the shell (2),
- heat transfer fluid supply means (105, 111, 112, 113, 114),
- at least one means (103) to produce heat transfer fluid droplets in said casing, so as to place all or part of said droplets in contact with the shell (2).

24. Cooling system (100) according to claim 23, characterised in that the or each confinement casing (101) is at a specified distance from at least one of the lateral walls (21, 22) of the shell (2) less than 20 cm.

25. Cooling system (100) according to claim 23 or 24, characterised in that each confinement casing (101) is positioned so as to overlap with the average level of the interface (19) between the electrolyte bath (13) and the liquid metal pad (12).

26. Cooling system (100) according to any of claims 23 to 25, characterised in that it comprises a plurality of confinement casings (101) distributed around the shell (2).

27. Cooling system (100) according to any of claims 23 to 26, characterised in that the heat transfer fluid supply means (105, 111, 112, 113, 114) comprise routing means (105, 111, 112, 114) and a treatment column (113).

28. Cooling system (100) according to any of claims 22 to 27, characterised in that said means (103) to produce droplets is a spraying means.

29. Cooling system (100) according to claim 28, characterised in that that spraying means (103) comprises at least one nozzle.

30. Cooling system (100) according to claim 29, characterised in that said nozzle is an aerosol nozzle.

31. Cooling system (100) according to any of claims 22 to 30, characterised in that it also comprises at least one means (104, 110) to supply each confinement casing (101) with carrier gas.

32. Cooling system (100) according to claim 31, characterised in that it also comprises a means (108) to produce said droplets using said carrier gas.

33. Cooling system (100) according to any of claims 22 to 32, characterised in that it comprises at least one means (109) to control the production rate of said droplets.

34. Cooling system (100) according to any of claims 22 to 33, characterised in that it comprises means (106, 120, 121, 122, 123, 124) to evacuate all or part of the vaporised heat transfer fluid.

35. Cooling system (100) according to claim 34, characterised in that the evacuation means (106, 120, 121, 122, 123, 124) comprise evacuation conduits (106, 120, 121, 124) and a suction or blowing means (123).

36. Cooling system (100) according to claim 34 to 35, characterised in that the evacuation means (106, 120, 121, 122, 123, 124) comprise a condenser (122) to condense the suspended heat transfer fluid.

37. Use of the cooling method according to any of claims 1 to 21 to cool an igneous electrolysis aluminium production cell.

38. Use of the cooling system according to any of claims 22 to 36 to cool an igneous electrolysis aluminium production cell.

39. Method to regulate an electrolytic cell intended for aluminium production by means of igneous electrolysis including a method to cool said cell according to any of claims 1 to 21.

40. Electrolytic cell intended for aluminium production by means of igneous electrolysis comprising a cooling system according to any of claims 22 to 36.